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On the Treatment of White Wine by Means of Bentonite and Cation Exchanger

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INTRODUCTION

During the past several years wine industries have become interested in bentonite for correcting abnormalities of appearance in wines[1)-4)].

KEAN and MARSH[1)] recommeded bentonite for removing objectionable impurities to turbidity from white table wines.

This work was planned to determine how bentonite affects the composition of white wine and was reported on the effect of ion exchanger used together with bentonite.

MATERIALS AND METHODS

1. *Treatments of wine*

For treating white dry wine, various quantities of bentonite, supplied by the KUKITA YAKUHIN KOGYO Company, Tokyo, Japan, were used.

Since it was desired to determine the effects of bentonite on the mineral contents of wine, 300 ml. sample of white dry wine was treated in the usual manner and an analysis made for these minerals before and after treatment.

The wine employed in this work was cloudy and had colloidal suspension perceptible to the naked eye. This wine was made from grape (Golden Queen) produced in Zenkozi, Yamanashi Pref. Japan.

The bottles containing the wine and bentonite were shaken from time to time for 2 days, and the bentonite was separated by means of decantation from wine. It was filtered the second time to make certain that all traces of bentonite were removed. This procedure was carried out on each treatment with the various quantities of bentonite. All the samples were analysed for mineral contents.

On the one hand, for treating the wine, 1 g. of cation-exchage resin, Amberlite IR-120 regenerated with 1 *N* HCl per 100 ml. of wine were used together with bentonite and they have been examined as above-stated.

2. *Analytical methods*

Throghout this work the following analytical methods were employed

1) Calcium and magnesium were determined by E.D.T.A titration[5].
2) Iron was determined directly in the wine[6].
3) Potassium was determined as follows :

Solution required :

(a) 0.1 *N* NaOH
(b) 95 % Ethyl alcohol
(c) 0.37 *M* $NaC_4H_5O_6$
(d) Washing solution A, prepered by adding cream of tartar to a mixture of ethyl alcohol and water (1 : 1 by volume), stirring, and standing in the refrigerator overnight and filtering in the morning. It must be kept cold.
(e) Washing solution B, ice cold ethyl alcohol-water mixture (1 : 1 by volume).

To 40 ml. of wine in a beaker, 10 ml. of sodium hydrogen tartrate solution were added. If V is the volume of alcohol in 100 ml. of wine, then 25~0.4 V of alcohol were added and 0.4 V ml. of water were also added. The beaker was stirred and scratched to initiate crystallization and left on the bottom shelf of the refrigerator overnight, i.e. at about freezing point.

The precipitate was filtered off at the pump and it and the beaker were washed with two lots of 5~7 ml. of washing solution A. It was then washed once with the same volume of washing solution B. The filter paper was drained off and transfered to the original beaker. The Buchner funnel was washed with hot water into the beaker and the sides of the beaker was washed down. The volume of water, about 80 ml., was brought to the boil and titrated against 0.1 *N* NaOH, phenolphthalein being used as an indicator until the red colour is well developed.

In this case the potassium content of the original wine is given by : potassium concentration=0.00259 T g.-ion/l., where T is the titre in ml. of 0.1 *N* NaOH[7].

RESULTS AND DISCUSSION

The amounts of bentonite and period of contact were taken arbitrarity. These values were within the range recommended by the bentonite manufactures and by the literature. Larger amounts would be less desirable because they are costly, because they may extract too much of the character and coloring matter from the wine, and because in lager amounts bentonite may impart obnoxious tastes.

The data show that the amounts of main minerals present in white dry wine were materially changed by treatment with bentonite. These changes also were given as the per cent of the original value of the samples (Table 1).

The change in iron seems to be large when the amount increased is compared on a percentage basis with the amount present in the original wine,

Table 1. *Effect of Treatment with Bentonite on Mineral Contents of White Dry Wine*

Experiment No.	Amount of Bentonite used	Constituent *			
		Potassium	Calcium	Magnesium	Iron
	g/l.	mg/1.			
1	0.1	853(3.0)	——	——	25 (4.2)
2	0.3	——	160(2.6)	——	26 (8.3)
3	0.5	878(6.6)	160(2.6)	74(23.3)	26 (8.3)
4	1.0	873(5.6)	——	68(13.3)	27(12.5)
5	1.5	871(5.3)	176(12.8)	——	28(16.6)
6	2.0	——	172(10.2)	76(26.7)	29(20.8)
7	3.0	878(6.0)	——	——	30(25.0)
8	5.0	880(6.3)	176(12.8)	72(20.0)	32(33.3)
9	10.0	875(5,7)	——	78(30.0)	34(41.6)
10	15.0	878(6.0)	170(9.0)	72(20.0)	35(45.8)
11	20.0	880(6.3)	——	81(35.5)	37(54.2)
12	30.0	878(6.0)	168 (7.7)	81(35.0)	39(62.4)
nil		828	156	60	24

* Figures within parentheses indicate per cent increase of minerals from sample.

and there was a decided and uniform increase of iron as the quantities of bentonite employed was increased. A 62.4 % increase of iron was obtained for treatment with 30 g. of bentonite per liter of wine. Only small amounts of calcium were increased from the wine treated with bentonite.

Some of the undesirable metalic taste of wine treated with bentonite was probably due partially to its high iron content. In case of treatments of wine with bentonite, however the wine becomes clear, mineral contents of wine have remarkably increased, as the result of which we have various defects in such wines.

Table 2. *Effect of Utilization of Cation-exchange Resin together with Bentonite on the Mineral Contents of Wine*

Amounts used		Constituent			
Bentonite	Cation Exchanger	Potassium	Calcium	Magnesium	Iron
g/100 ml.		mg/1.			
0.15	1.0	414	42	27	6.5
0.20	1.0	455	42	26	6.5
nil		828	156	60	24.0

We have made trial of utilization of ion exchanger together with bentonite for fear of increasing the mineral contents of wine treated with bentonite. Table 2 presents data for the adsorption of minerals by cation-exchange resin, Amberlite IR-120, from sample. Per cent removal of iron from wine treated with bentonite was approximately similar to the removal of calcium, Considerably more than iron, calcium, magnesium was removed from the wine than from the potassium.

It is recognized that ion exchange treatment accomplished together with bentonite is more useful than the treatment with bentonite only.

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